

APPENDIX B: GROUND WATER REMEDIATION

1.0 GROUND WATER REMEDY

Seaboard and PIC (collectively “Defendants”) shall take the actions described herein to reduce nitrate-nitrogen concentrations in the ground water at Lacey 1 Bryan, Lacey 4 Grimes, and Lacey 6 Miller in accordance with the schedule and remedy performance requirements for ground water at each of these locations. Defendants may use Monitored Natural Attenuation (“MNA”), as described below, to achieve nitrate-nitrogen concentration reduction in the ground water only if the Defendants periodically demonstrate that the use of MNA meets or exceeds the performance requirements set out in this Appendix. Defendants’ MNA remediation and related ground water evaluations are based upon EPA OSWER Directive No. 9200.4-17P (1999). If Defendants fail to demonstrate timely compliance with terms established herein for MNA, Defendants shall undertake the Alternative Remedies (described in Section 1.4) to meet the Remedy Performance Requirements set forth in Section 1.1.

1.1 REMEDY PERFORMANCE REQUIREMENTS

The overall remedy requirement is to restore the ground water affected by suspected leakage from Infrastructure Source(s) within the time frame set by this Consent Decree (see Sections 1.3 and 1.4 below). The cleanup requirement for these ground water remedies (including MNA) is the higher concentration of the following:

- a.) 10 mg/L for nitrate-nitrogen, or
- b.) Background Water Quality, defined as the water quality in a sample from a monitoring well or temporary well located up-gradient of the barn or lagoon area that is considered to be the source. The background data used will be nitrate levels at the time the remedy’s performance is being evaluated (i.e., the background cleanup standard for a farm is expected to change with time). The concentration up-gradient of the Infrastructure Source(s) shall be used as the cleanup standard, without adjustment.

1.2 MONITORED NATURAL ATTENUATION (MNA) REMEDY: INITIAL ACTIVITIES

1.2.1 ACCESS

Within 30 days after entry of this Consent Decree, Defendants shall contact all applicable land owners and seek to obtain access for Direct Push Technology (“DPT”) and well placement on private property. In the event that site access agreements are not obtained through commercially reasonable efforts within 60 days after entry of this Decree, Defendants shall notify the EPA Project Manager by telephone as soon as possible, but no later than 48 hours after Defendant determines that access has been denied. Commercially reasonable efforts shall include, but not be limited to, requiring Defendants to pay reasonable rental costs and reasonable compensation for actual losses sustained by the owner or occupants of the realty. Within 7 days of such oral notification, Defendants shall notify EPA in writing of the failure to gain such site access agreements and provide information regarding Defendants’ efforts to obtain such agreements. EPA and ODAFF will provide support in obtaining off-site access for both DPT and well placement, as needed. If neither EPA nor ODAFF are successful in obtaining access, Defendants shall, within 15 days of such notification from EPA, propose, for EPA’s approval, alternative locations for the placement of DPT or wells, and proceed with the remedy as specified.

1.2.2 DPT STUDIES

At Lacey 1 Bryan, Lacey 4 Grimes, and Lacey 6 Miller, Defendants shall perform a DPT field study to delineate nitrate-nitrogen in ground water that is above the applicable Section 1.1 remedy standard and is substantially due to suspected leakage from Infrastructure Source(s). Defendants shall use these DPT data to guide the subsequent placement of MNA monitoring wells. Defendants shall complete such DPT field studies within 30 days of securing the necessary access (or, if access is denied, within 30 days of securing EPA's approval for alternative locations), and shall report results of such field studies and proposed MNA well locations to EPA within 30 days of the completion of the DPT field studies.

1.2.3 MODELING

Following the DPT field studies, Defendants shall run the MODFLOW predictive computer model, or another EPA-approved alternative model, to predict MNA behavior, and report results to EPA upon completion. Defendants shall update this predictive model at the 2-year milestone referenced below, incorporating data from the first 5 sampling events, and report results to EPA upon completion.

1.2.4 MONITORING

- a.) At Lacey 1 Bryan, Lacey 4 Grimes, and Lacey 6 Miller, Defendants shall:
 - 1) retain an existing monitoring well immediately down-gradient of the source to provide source area water quality data as part of MNA monitoring;
 - 2) if Background Water Quality is the remedy performance requirement, as set forth in Section 1.1.b, retain or install a background well immediately up-gradient of the from the Infrastructure Source(s);
 - 3) screen MNA wells across the upper 10 feet of the saturated zone; and
 - 4) collect a soil sample from below the water table at each new MNA monitoring well location and analyze it for denitrifying bacteria.
- b.) Defendants shall complete MNA well placement within 60 days of Defendants' receipt of EPA's approval of proposed MNA well locations. Defendants shall place MNA monitoring wells at locations approved by EPA as follows:
 - 1) MNA monitoring wells at Lacey 1 Bryan and Lacey 6 Miller shall be placed along the axis of the area of elevated nitrate-nitrogen in ground water at a typical spacing of approximately 500 feet. One or two additional wells shall be installed to monitor plume width if needed, based upon plume geometry as observed by the DPT study. At Lacey 1 Bryan, the MNA well system shall also include existing well 519-04. No fewer than four but no more than six new wells at each of Lacey 1 Bryan and Lacey 6 Miller shall be installed for evaluation of MNA performance.
 - 2) Two MNA wells shall be placed to monitor the plume at Lacey 4 Grimes. Existing well 585-03 shall be retained as a source area monitor well. If any Lacey 4 Grimes MNA well location falls within the farm's land application area, then Defendants shall maintain a no-application buffer zone at each such well location, using valve stops sufficient to ensure that the well will measure and perform as intended, notwithstanding its location in a land application area. Well locations and buffer zones shall be structured to minimize any loss of application area, consistent with the purpose of well placements.

1.2.5 REPORTING

Defendants shall provide a report to EPA regarding well placement at Lacey 1 Bryan, Lacey 4 Grimes, and Lacey 6 Miller detailing the activities undertaken pursuant to this section 1.2 as part of the Annual Report required by section 1.6, below.

1.3 MNA REMEDY: IMPLEMENTATION

If Defendants fail to satisfy the criteria and/or standards for the MNA Remedy as specified in Sections 1.3.1, the Defendants shall perform an Alternate Remedy in compliance with the requirements of Section 1.4.

1.3.1 PERIODIC PERFORMANCE EVALUATIONS

Defendants shall evaluate periodically, as specified herein, the efficacy of the MNA ground water remediation. This evaluation shall be based upon changes in the concentration and extent of the ground water plume. Defendants shall sample, analyze, evaluate, and report on the efficacy of the MNA remedy as follows.

1.3.1.1 Sampling. Defendants shall sample ground water from the MNA wells upon well installation and on a semi-annual basis thereafter for two years (i.e., five sampling events), and then annually thereafter. Upon installation, the sampling event analytical parameters shall include nitrate-nitrogen, nitrite-nitrogen, ammonia-nitrogen, and major ions. Ammonia-nitrogen shall be measured until it is below 10 mg/L; samples from subsequent events need be tested for nitrate-nitrogen only. All sampling events, including the first event, shall include field measurement for pH, specific conductance, dissolved oxygen, temperature, oxidation-reduction potential, and depth to water. Following Defendants' completion of the first five sampling events, Defendants shall propose a schedule for annual sampling for EPA approval. Defendants shall report all analytical results and field measurements of each sampling event to EPA within 45 days of sample collection.

1.3.1.2 Start Date. The Start Date for MNA, and thus the measuring point for the 2, 5, 10, and 15 year milestones noted below, shall be the date of initial MNA well sampling conducted pursuant to section 1.3.1.1 for the particular facility. If, however, the maximum concentration observed in MNA wells at a given Farm is less than 45 percent of the maximum concentration observed in the May 2002 sampling event for that Farm, following notification of such fact to EPA, Defendants may utilize May 2002 as the Start Date with respect to the milestones described in 1.3.1.5 and 1.3.1.6, and to utilize the concentrations observed in May 2002 as the starting point for the concentration reduction calculations described in 1.3.1.7.

1.3.1.3 Reporting Requirements. Defendants shall report to EPA on the completed performance evaluation for each specified milestone year, as required below, within 120 days of Defendants' receipt of preliminary laboratory analytical data from performance evaluation sampling.

1.3.1.4 Periodic Performance Requirements. Defendants shall use collected ground water data for the performance evaluation at the 2, 5, 10, and 15-year milestones of the MNA remedy performance (assuming MNA is the remedy in place at those times). At each

time milestone, Defendants may continue to use MNA as the remedial approach until the next performance milestone (without modification or enhancement) if and only if the Defendants demonstrate that the area of investigation satisfies at least one of the following criteria:

- a.) Decreasing plume core concentrations, with stable or decreasing overall plume size (a “reducing plume”);
- b.) Decreasing overall plume size, with stable or decreasing core concentrations (a “reducing plume”);
- c.) Decreasing plume core size, with stable or decreasing plume core concentrations and stable or decreasing overall plume size (a “shrunk plume”); or
- d.) Increasing overall plume size, with decreasing overall plume concentrations (a “nearly stable plume”).

If Defendants fail to meet at least one of these four criteria, Defendants shall perform an Alternate Remedy in compliance with the requirements of Section 1.4.

1.3.1.5 10-Year Evaluation of MNA. If MNA is still in use 10 years from the Start Date, in order to continue with MNA rather than performing an Alternate Remedy in compliance with Section 1.4, Defendants shall, at the 10-year milestone, demonstrate that the maximum off-property nitrate-nitrogen concentrations show at least a 56 percent reduction in nitrate-nitrogen relative to the applicable cleanup standard (Section 1.1). The percent reduction shall be calculated as illustrated in Section 1.3.1.7.

If Background Water Quality is the remedy performance requirement as set forth in Section 1.1.b, and Defendants suspect that the up-gradient well is not representative of background, Defendants may perform a DPT ground water investigation of the immediately up-gradient area and use those data to propose an alternative background well location. Any alternative well location must be approved by EPA. For performance evaluations, however, background water quality shall be determined using an actual well (permanent or temporary), and not a DPT sample.

1.3.1.6 15-Year Evaluation of MNA. If MNA is still in use 15 years from the Start Date, in order to continue with MNA rather than performing an Alternate Remedy in compliance with Section 1.4, Defendants shall, at the 15-year milestone, shall evaluate the remedy’s performance at that time according to the following scenarios, as applicable:

- a.) Evaluating MNA Performance “On-property” (i.e., property within the boundaries identified in Appendix A). If, at the end of the 15th year after the Start Date, the maximum concentration measured within the on-property portion of the plume represents at least a 90 percent reduction in nitrate-nitrogen relative to the applicable cleanup standards (calculated in accordance with Section 1.3.1.7 below), then Defendants may continue to use MNA as a remedy without modification or enhancement until cleanup standards are achieved, subject to (1) the requirement to perform continuing performance evaluations every 5 years, and (2) the continuation of the current or comparable property use (i.e., non-residential). If these criteria are not satisfied, Defendants shall perform an Alternate Remedy in compliance with Section 1.4.

- b.) Evaluating MNA Performance “Off-property” (i.e., property beyond the boundaries provided in Appendix A).

1) If, at the end of the 15th year after the Start Date, the maximum concentration measured within the off-property portion of the plume represents at least 90 percent reduction in nitrate-nitrogen relative to the applicable cleanup standards (calculated in accordance with Section 1.3.1.7 below), then Defendants may continue to use MNA without modification or enhancement for an additional two years. If this criterion is not satisfied, Defendants shall perform an Alternate Remedy in compliance with Section 1.4.

2) If, at the end of the 17th year after the Start Date, the maximum concentration measured within the off-property portion of the plume represents at least 92 percent reduction in nitrate-nitrogen relative to the applicable cleanup standards (calculated in accordance with Section 1.3.1.7 below), then Defendants may continue to use MNA without modification or enhancement, subject to the requirements to report MNA ground water monitoring results to EPA annually (pursuant to Sections 1.3.1.1 and 1.6), and to perform continuing performance evaluations every 5 years. If this criterion is not satisfied, Defendants shall perform an Alternate Remedy in compliance with Section 1.4.

1.3.1.7 Calculation of Concentration Reduction.

Defendants shall use the following calculation methods for comparing observed concentration reductions to the 56, 90 and 92 percent reductions discussed in sections 1.3.1.5 and 1.3.1.6 above, as well as for similar calculations.

- a.) If 10 mg/l is the remedy performance requirement, as set forth in Section 1.1.a: The percentage reduction in concentration shall be calculated as the change between the initial and final concentrations relative to the remedy performance requirement.

Example of Calculation Method in operation:

Maximum initial concentration = 70 mg/L

Maximum final concentration = 16 mg/L

Remedy Performance Requirement = 10 mg/L nitrate-nitrogen

Percentage reduction toward remedy performance requirement = $(70 - 16) / (70 - 10) = 54/60 = 90\%$

A reduction of this magnitude would therefore be considered to meet the 90 percent reduction standard discussed immediately above.

- b.) If Background Water Quality is the remedy performance requirement, as set forth in Section 1.1.b: The calculation method accounts for possible changes in background concentration over time, and measures the percent change of the difference between the maximum down-gradient and background concentrations (i.e., a comparison between initial and final difference).

Example of the Calculation Method in operation:

Maximum initial concentration = 70 mg/L

Initial Background = 19 mg/L

Maximum final concentration = 18 mg/L
Final Background = 15 mg/L
Initial Difference (background vs. maximum down gradient) = 70 - 19 = 51 mg/L
Final Difference = 18 - 15 = 3 mg/L
Percentage reduction toward background = $1 - (18 - 15)/(70 - 19) = 1 - (3/51) = 94.1\%$

1.3.2 WATER SUPPLY WELL PROTECTION

- a.) If Defendants identify, by MNA delineation or other monitoring activities required by this Decree, an exceedance of the least stringent performance standard set forth in Section 1.1 at a water supply well used for human consumption, Defendants shall provide alternative water supplies to the well user within 72 hours of receipt of preliminary laboratory analytical data demonstrating such exceedance.
- b.) If the provision of alternative water supplies is required, Defendants may at any time evaluate the likely source(s) of elevated nitrate-nitrogen triggering such requirement at the subject well. If Defendants decline to evaluate the source, or if Defendants' evaluation demonstrates that the elevated nitrate-nitrogen is substantially derived from suspected leakage from Infrastructure Source(s), Defendants shall continue provision of alternative water supplies until nitrate-nitrogen concentrations at the supply well decline below the applicable remedy standard from Section 1.1.
- c.) If Defendants conclude that the elevated nitrate-nitrogen is not substantially derived from suspected leakage from Infrastructure Source(s), Defendants may submit evidence of this conclusion to EPA together with a request to discontinue provision of alternative water supply. Upon receipt of Defendants' request, EPA shall, within 60 days, either approve the request, reject the request with comments, or request additional information. If EPA approves Defendants' request, Defendants may notify water supply recipient(s) and discontinue provision of alternative water supply upon receipt of such approval. If EPA does not approve Defendants' request, Defendants shall, within 30 days of receiving EPA's response, either (i) revise the submittal consistent with EPA's comments or request for additional information, or (ii) submit the matter for Formal Dispute Resolution under Section IX of this Consent Decree. Defendants shall continue to provide alternative water supplies as required until EPA approves a request to discontinue such provision, or until the Court so provides following the Dispute Resolution process.
- d.) If Defendants detect, by MNA monitoring or otherwise, indications that a portion of the plume is moving beyond the monitoring network, Defendants shall either: (1) track that portion of the plume to determine whether it may threaten any water supply well, in accordance with a schedule and approach approved by EPA; or (2) implement an Alternate Remedy to address that portion of the plume, using the schedule and approach provided by Section 1.4.

1.4 ALTERNATIVE REMEDIES

If the MNA remedy does not meet the performance requirements set forth in Section 1.3.1 or if any other term of this Consent Decree requires Defendants to perform an Alternative Remedy, Defendants shall submit an Alternative Remedy Work Plan, including an implementation schedule, within 90 days of the identification of remedy failure or the occurrence of any other condition triggering performance of Section 1.4, as follows:

- a.) The Alternative Remedy Work Plan shall include:
- 1) A detailed description of the alternative remedy, which may include an enhancement of MNA if such enhancement appears likely to allow MNA to meet remedy requirements. Other possible remedies include hydraulic control, carbohydrate addition, and/or phytoremediation. Other alternatives may be proposed by Defendants, and EPA will not unreasonably refuse to allow the use of such alternatives.
 - 2) A detailed explanation demonstrating that the proposed alternative(s) are likely to achieve the remedy performance requirements of Section 1.1 within 15 years of the Start Date, unless a lesser timeframe is agreed to by the parties.
 - 3) In the event Defendants are required to implement an Alternative Remedy by virtue of Section 1.3.1.6, a schedule of implementation to completion not to exceed 4 years.
- b.) EPA may approve the Work Plan or decline to approve it and provide written comments. Within 60 days of receiving written comments from EPA, Defendants shall either (a) revise the submittal consistent with the written comments and provide the revised submittal for final approval to Plaintiffs; or (b) submit the matter for dispute resolution, in accordance with the terms of this Decree. Upon receipt of EPA's final approval of the Plan, or upon completion of the dispute resolution process, Defendants shall implement the approved submittal in accordance with the schedule specified therein.

1.5 TERMINATION OF MNA OR ALTERNATIVE REMEDY

- a.) The MNA remedy, or the Alternative Remedy if one has been required, will be considered complete when the maximum ground water concentration in the plume is less than the applicable cleanup standard set forth in Section 1.1 for two consecutive sampling events.
- b.) At the termination of the MNA remedy, or the Alternative Remedy if one has been required, Defendants shall plug and abandon all MNA monitoring wells, except well 519-04 at Lacey 1 Bryan. Defendants will maintain well 519-04 until it is no longer required for monitoring purposes under applicable Oklahoma regulations.

1.6 ANNUAL REPORTING

In accordance with Sections XIII and XIV of this Consent Decree (Notices and Submittals and Submissions Requiring EPA Approval), Defendants shall provide an Annual Report (see also Section 2.7 of Appendix C) to EPA on or before January 31 of each year for the previous calendar year (or on another schedule for annual submission as approved by EPA). Unless a different reporting timeframe is identified in this Appendix B for data, analytical results, evaluations, or other information, Defendants shall report information generated pursuant to activities required by the following provisions of this Appendix B, as applicable for any given year, to the EPA project Manager in this Annual Report. Any other information required to be reported to EPA in this Appendix B may also be submitted as a part of this Annual Report, so long as such reporting does not extend the time for such submittal beyond applicable timeframes specified herein.

- a.) Section 1.2.4(a)(4): Results of microbial analysis with digital copies of lab reports;
- b.) Section 1.3.1.1: Annual ground water sampling results from MNA monitoring, including potentiometric surface maps, with digital copies of laboratory reports and field documentation;

- c.) Section 1.3.1.4, 1.3.1.5 and 1.3.1.6: MNA performance evaluations (so long as these are provided within 120 days of Defendant's receipt of preliminary analytical data from MNA ground water sampling);
- d.) Section 1.3.1.5: Background concentration submittal and supporting data;
- e.) Section 1.3.1.7: Percentage reduction calculations; and
- f.) Section 1.4: Reporting on the implementation, effectiveness, and progress of any alternative remedy.

1.7 EARLY COMPLIANCE

To the extent Defendants have commenced implementation of the actions specified in Sections 1.2 or 1.3 at any time after January 1, 2006 but prior to entry of this Consent Decree and in full compliance with the requirements stated herein, such actions may be credited as compliance with these Sections if Defendants submit a report for EPA's approval no later than 90 days after entry of this Decree or in their first Annual Report submitted pursuant to this Section, whichever is later, explaining what early compliance actions were taken and certifying, in compliance with Section XIV of this Consent Decree, that all such actions were taken in compliance with all the requirements of this Consent Decree. If, after review of this submittal, EPA determines that the actions taken comply with the requirements of this Consent Decree, EPA shall so notify Defendants within 180 days of receipt of Defendants' report.